Lead and Cadmium in Children's Vinyl Products

By Joseph Di Gangi PhD

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Summary of Findings

A Greenpeace investigation revealed the presence of hazardous levels of lead and cadmium in a variety of vinyl conscproducts, including items specifically designed and marketed for children. The study was spurred by the discovery of hazardous lead levels in vinyl blinds and associated lead poisoning of children in 1996. Since no government agency appeared to be investigating whether other vinyl consumer products might also pose a similar health risk, Greenpeace initiated a nationwide study of vinyl products.

The Greenpeace investigation discovered:

- Lead is present in vinyl products throughout the U.S. A survey of 10 major U.S. cities showed the presence of many lead-containing products. They were also found in Montreal, Quebec, Canada.
- Lead- and cadmium-containing vinyl products are readily available from some of the nation's leading retailers, including Kmart, Wal-Mart, Target, and Toys R Us.
- Children are a marketing target. Products featured Barbie, Minnie and Mickey Mouse, 101 Dalmations, Michael Jordan, Bugs Bunny, and various other Looney Tunes characters.
- Lead-containing vinyl products are common. The investigation began by testing vinyl children's products purchased in Chicago. Twenty-one percent of the vinyl consumer products examined contained greater than 100 parts-per-million lead (28 out of 131). Since all of the items were purchased at national chain stores, this high percentage may reflect the U.S. frequency for lead-containing vinyl products.
- The lead levels are hazardous. Eighteen percent of the products examined violated the limit advocated by the Consumer Product Safety Commission staff for vinyl miniblinds. Cadmium is an added hazard. In every case in which it was measured, all of the lead-containing products also contained varying levels of cadmium, a known carcinogen and renal toxin which is not regulated in children's products by the Consumer Product Safety Commission.
- Lead- and cadmium-containing vinyl products are widely available in California, despite its stringent regulation of carcinogens and reproductive toxins. A representative sample of items grossly exceeded limits for exposure to lead and cadmium set by the Safe Drinking Water and Toxic Enforcement Act of 1986, also known as Proposition 65.
- Both lead and cadmium are readily available for ingestion by children. Lead and cadmium were released to the surfaces of products as they aged. Lead also became available under conditions that mimic accidental swallowing.
- The study began in Chicago with a mix of 131 vinyl products (also known as PVC or polyvinyl chloride). The items were bought at national chain stores and included vinyl clothing, backpacks, cables, toys, and household items. Lead testing by an independent laboratory showed that about one-fifth of the products (28) contained from 100 to over 22,000 parts-per-million (ppm) lead.

Lead and Cadmium in Vinyl Consumer Products

Item	Store	Lead (ppm)	Cadmium (ppm)
backpack; Minnie's Spring Fever	Disney	163	224.5
backpack; 101 Dalmations	Kmart	104	321.0
backpack; Barbie	Kmart	372	75.7
barbell; 2lb vinyl cover	Target	7,050	12.4
breast milk cooler; Medela	Target	375	29.3
cable; Sega Controller	Toys R Us	4,100	17.4
cable; Gemini 3' video coaxial	Kmart	7,505	10.3
cable; Gemini mod. Phone cord	Kmart	865	15.3
cable; Philco in-ear headphones	Kmart	3,770	11.0
cable; Philco headphones	Kmart	3,490	52.4
cable; AT&T 25' phone line cord	Kmart	213	6.5
cable; Gemini computer printer	Kmart	5,765	18.1
key ring; Disney Minnie Totes	Target	1,430	6.1
pencil case; Fun d Mentals	Kmart	197	25.6
placemat; Warner Bros. Space J.	Kmart	178	7.9
placemat; Barth & Dreyfuss	Kmart	398	6.2
placemat; Gloria Vanderbilt	Wal-Mart	505	12.0
purse; Pacific Kids	Wal-Mart	349	104.8
rain hat; Warner Bros. Tweety	Warner Bros.	4,060	35.4
rain coat; Columbia Youth Parka	Uncle Dan's	22,550	47.9
shower curtain; Springs Bath	Wal-Mart	864	105.5
tent pole; Barbie Slumber	Toys R Us	6,105	14.6
totebag; Tweety	Wal-Mart	459	228.5
toy; Looney Tunes hackey sack	Toys R Us	1,610	nd
toy; Kentucky Fried Chicken	Toys R Us	207	344.0
toy; Toteables cosmetics pouch	Target	392	152.0
toy; Dimples doll stroller	Toys R Us	7,115	22.6
umbrella; Looney Tunes	Toys R Us	817	27.0

Abbreviations: ppm, parts-per-million by weight in product; nd, not determined. All products shown were purchased in Chicago, Illinois. A representative sample of these products contained lead in cities throughout the U.S. See Results and Discussion for data and information regarding other cities. The Consumer Product Safety Commission staff-recommended limit for lead in vinyl is 200 ppm. Cadmium is not regulated by the Consumer Product Safety Commission. Proposition 65 regulates cadmium at one-tenth the level set for lead. Results shown are averages of duplicates. The average coefficient of variation was 9% and 22% for lead and cadmium respectively.

Eighteen percent of the products exceeded the maximum lead limit in vinyl formally recommended by the staff of the Consumer Product Safety Commission for vinyl miniblinds (200 ppm). More than half of these lead-containing vinyl products contained over 600 ppm lead and therefore would have been illegal and recalled if they had been made out of a regulated material like painted wood. In addition, all of the lead-containing

products also contained varying levels of cadmium, a known carcinogen and kidney toxin which is not regulated in children's products.

The investigation widened to include California since it has the most stringent regulation of lead and cadmium in the U.S. A group of the items found to contain lead in Chicago was also purchased in Los Angeles and San Francisco and tested for both toxic metals. All seventeen products contained both lead and cadmium at levels previously seen in Chicago. Despite evidence that both metals are available for ingestion, none of the items carried labels warning California parents or children about the presence of either lead or cadmium as required by Proposition 65.

The study expanded to include 10 major U.S. cities and Montreal. A representative sample of 19 lead-containing items from Chicago was sought in each locale. Not all of the products were found in every city, but all of the items which were purchased and tested contained lead. Seventeen of the 19 items in the sample exceeded the Consumer Product Safety Commission staff-recommended limit in the nationwide survey. The results indicate that vinyl products containing lead are readily available throughout the U.S. and in at least one major Canadian city.

In order to determine whether the vinyl items might release toxic lead or cadmium during foreseeable use over the lifetime of these products, Greenpeace tested the possible availability of the metals. Two studies were conducted by independent laboratories using Consumer Product Safety Commission protocols.

Three commonly chewed products were examined to determine if they might release lead to a child's body. The data demonstrated that swallowing less than one-hundredth of an ounce of either a Gemini phone cord, Disney key ring, or Kentucky Fried Chicken toy would exceed the exposure limit used by the Consumer Product Safety Commission. Even swallowing less than one-thousandth of an ounce would release more than four times the amount of lead legally permitted under California's Proposition 65. Most importantly, it may not be necessary to actually swallow an item to be poisoned by it since simply chewing and sucking on plastic cables is a known source of lead poisoning.

Seven products were tested to determine whether lead or cadmium could be released to the surface during aging. Lead- or cadmium-contaminated dust is especially hazardous since it can easily enter the body by licking, chewing, inhalation, and hand-to-mouth behavior. A Minnie Mouse backpack, 101 Dalmations backpack, Barbie backpack, Tweety totebag, Columbia rain coat, Barbie tent pole, and Warner Bros. rain hat all released lead during four weeks of laboratory aging. Cadmium was released by five of the six products that were examined. All levels of lead and cadmium on the product surfaces exceeded the Proposition 65 limits for both metals. Lead was also detected on the surfaces of all seven products right out of the package. The likely use of several vinyl products by a child would further increase the amount of lead and cadmium exposure.

The health hazard posed by lead in vinyl products is not just theoretical. In 1996, unexplainable high blood lead levels in children from Arizona, North Carolina, and

Virginia provoked an investigation by the Departments of Health. Unexpectedly, vinyl miniblinds were identified as the common source of lead dust. An investigation by the Consumer Product Safety Commission found that new vinyl miniblinds contained from 7,700 to 12,300 ppm lead. In contrast, painted toys are recalled by the agency if they contain greater than 600 ppm lead. The Consumer Product Safety Commission estimated that 25 million vinyl miniblinds containing lead are imported into the U.S. each year. An experimental study conducted by the agency demonstrated that light degraded the vinyl blinds and caused the formation of toxic lead dust which was apparently ingested by the children.

The Consumer Product Safety Commission issued a warning to the public and also entered into a voluntary agreement with the Window Covering Safety Council, the trade association of vinyl blind manufacturers. The agency sought reductions in lead content in vinyl miniblinds to the lowest level possible. The agency staff recommended a limit of 200 ppm lead in vinyl due to the cumulative health hazards posed by lead poisoning. Retailers were instructed to place a warning label on brands known to contain lead. Several months later, Greenpeace found unlabeled, lead-containing miniblinds featured in K-Mart's 1996 Labor Day Sale. The blinds were deeply discounted and present in Kmart stores across the U.S.

In contrast to the federal advisory to retailers, the State of California filed suit against companies that made or sold lead-containing blinds. Twelve companies including Wal-Mart, Kmart, J. C. Penney, and Montgomery Ward & Co. were named as defendants for violating Proposition 65.

The initial discovery of lead in vinyl blinds was surprising to the public, yet the industry has been using lead stabilizers and pigments in vinyl since the 1950s. Vinyl contains chlorine and therefore requires the addition of metals that act as stabilizers to retard degradation.

Lead causes irreversible nervous system damage, decreased intelligence, behavioral abnormalities, and learning disabilities. Lead also interrupts normal kidney function and blood formation. Cadmium can cause kidney damage and lung cancer. Both metals are developmental and reproductive toxins and cause damage at extremely low doses. Children are especially susceptible to these metals and no children's product should contain them. Neither metal is regulated in vinyl consumer products.

Findings, Factors and Recommendations

Findings

- Lead and cadmium are widely present in vinyl consumer products including those designed for children.
- The amount of lead present in many vinyl consumer products exceeds current Consumer Product Safety Commission regulations as well as the formal staff-recommended limit for lead in vinyl.
- Lead and cadmium in vinyl consumer products represent a health hazard since both are inevitably released as toxic dust when the product deteriorates.
- The amount of lead and cadmium released by a representative sample of vinyl consumer products violates California's Safe Drinking Water and Toxic Enforcement Act of 1986.

Factors

- Lead is a neurotoxin. Cadmium is a renal toxin and carcinogen. Both metals are highly toxic and especially damaging to children.
- Lead and cadmium are widely present in vinyl consumer products as stabilizers, components of pigments, or as contaminants.
- Lead is not regulated in vinyl consumer products by the Consumer Product Safety Commission. An agency staff-recommended limit was not adopted.
- Cadmium is not regulated in consumer products by the Consumer Product Safety Commission.
- There are alternative materials for all consumer uses of vinyl.

Recommendations

1. Parents should not purchase vinyl or PVC products to which children might be exposed including but not limited to rain coats, umbrellas, clothing, backpacks, ponchos, school supplies, purses, sports equipment, and toys. Vinyl children's products should be returned to the manufacturer or retailer.

2. Retailers, distributors, and manufacturers should remove vinyl children's products containing lead and/or cadmium from the market.

3. The Consumer Product Safety Commission should prohibit the use of lead and cadmium in consumer products such as vinyl. Vinyl children's products containing lead or cadmium should be recalled by the agency. A recall level should be set low enough to prohibit the entry of lead- and/or cadmium-containing products like the vinyl backpacks shown in Table 1, into the market.

4. Vinyl products sold in California should be tested for lead and cadmium and labeled by retailers and manufacturers if they are found to contain either metal. The State of

California should pursue legal action against manufacturers and retailers selling lead- and cadmium -containing consumer products that violate the Safe Drinking Water and Toxic Enforcement Act of 1986 (also known as Proposition 65).

5. Retailers and trademark licensers should not market vinyl products to which children might be exposed. This should be made explicit in future sales and licensing agreements.

6. The plastics industry and toy manufacturers, through trade associations such as the Society of Plastics Industry and the Toy Manufacturers of America, should adopt an industry-wide standard against manufacturing children's products with vinyl.

Introduction

In 1996, the unexplained lead poisoning of children in three states provoked an investigation that identified vinyl blinds as the common source of lead dust. [1] The blinds were not suspected to be a source of lead even though vinyl has contained lead stabilizers since the 1950s. Vinyl requires the addition of metal stabilizers because it contains chlorine (vinyl is also known as polyvinyl chloride or PVC). Without a stabilizer, the chlorine can degrade the product by forming hydrochloric acid. Lead effectively stabilizes bound chlorine and binds any free chlorine that might be formed during processing or degradation. [2] Lead is also used in various pigments that color plastic.

There are three important aspects of the lead poisoning associated with vinyl blinds. First, lead poisoning is one of the most serious preventable public health hazards in the U.S. [3] Lead decreases intelligence and damages the nervous system at extremely low doses. [4,5] Its effects are cumulative and irreversible. [6] Second, lead has a long history of serving the obligatory role of stabilizer in vinyl products. Finally, lead is released from vinyl during product degradation. The Consumer Product Safety Commission experimentally demonstrated that light and heat can cause degradation of vinyl and liberation of lead dust. [7] Unfortunately for children, vinyl miniblinds release lead during normal product use. [8]

Given the serious health effects of lead and its inevitable release from vinyl blinds that contain it, Greenpeace asked whether other vinyl consumer products might also pose a lead hazard. Lead testing of vinyl consumer products began in Chicago, then widened to include 10 major U.S. cities and Montreal, Canada. Preliminary studies of bioavailability were conducted to determine the consequence of accidental swallowing. An accelerated aging study was conducted to determine whether toxic dust might be formed during product degradation.

Materials and Methods: (Please see Appendix 5)

Results and Discussion

A random survey in Chicago reveals lead-containing vinyl products

An investigation of vinyl consumer products in Chicago showed that many of them contained lead (Table 1). Roughly 20% of the 131 products that were surveyed contained lead. Table 1 shows 28 lead-containing vinyl items that were purchased at national chain stores like Kmart, Toys R Us, Target, and Wal-Mart. The products include a variety of common school products, clothing, toys, and household items. Eighty-six percent of the lead-containing items in Table 1 exceeded the 200 ppm standard for lead in vinyl proposed by Consumer Product Safety Commission staff. In fact, more than half of the lead-containing items contained greater than 600 ppm lead and therefore would have been illegal and recalled if they had been painted wooden toys.

Children are the marketing target

The vinyl items containing lead included items with popular children's characters like Minnie Mouse, 101 Dalmations, Barbie, various Looney Tunes characters, and even Michael Jordan (Table 1). Other vinyl products containing lead included common household items used by children such as a cable for a Sega Genesis video game, various phone cords, a VCR cable, and headphone cables (Table 1). The lead-containing list even included vinyl placemats whose normal proximity to food is especially troubling. Various vinyl clothing items also contained lead. A Warner Bros. rain hat featuring Tweety contained over 4,000 ppm lead and a popular Columbia rain coat for children showed over 22,000 ppm lead (Table 1). Several toys easily available for sucking or even designed for it contained lead. A small hackey sack featuring Warner Bros. Looney Tunes characters contained over 1,600 ppm lead. A Kentucky Fried Chicken toy destined for children's mouths contained roughly 200 ppm lead. A simple vinyl pouch containing cosmetics had nearly 400 ppm lead and a doll stroller for little girls showed over 7,000 ppm lead.

Vinyl products also contain cadmium

All of the vinyl products containing lead also contained cadmium. In some cases the levels of cadmium were even higher than the lead levels. Since cadmium is even more toxic than lead, the results are especially surprising. Especially alarming is the presence of cadmium in a Kentucky Fried Chicken toy designed to put into children's mouths. Each gram of this toy contained over 340 µg cadmium (µg is a microgram or one-millionth of a gram). Both the Minnie Mouse and 101 Dalmations backpacks also contained unexpected levels of the carcinogenic metal. Each gram of the two backpacks contained 225 and 321 µg of cadmium respectively. The total amount of cadmium in the product adds up rapidly. For example, the 101 Dalmations backpack weighs roughly 300 g and therefore contains about 96,300 µg cadmium. To place the results in perspective, the limit for exposure to inhaled cadmium dust in California is 0.05 µg per day. This

represents 1.8 billionths of an ounce per day. The 101 Dalmations backpack contained nearly 2 million times this level of cadmium.

Table 1. Lead and Cadmium in Vinyl Consumer Products Purchased in Chicago

Item	Store	Lead (ppm)	Cadmium (ppm)
backpack; Minnie's Spring Fever	Disney	163	224.5
backpack; 101 Dalmations	Kmart	104	321.0
backpack; Barbie	Kmart	372	75.7
barbell; 2lb vinyl cover	Target	7,050	12.4
breast milk cooler; Medela	Target	375	29.3
cable; Sega Controller	Toys R Us	4,100	17.4
cable; Gemini 3' video coaxial	Kmart	7,505	10.3
cable; Gemini mod. Phone cord	Kmart	865	15.3
cable; Philco in-ear headphones	Kmart	3,770	11.0
cable; Philco headphones	Kmart	3,490	52.4
cable; AT&T 25' phone line cord	Kmart	213	6.5
cable; Gemini computer printer	Kmart	5,765	18.1
key ring; Disney Minnie Totes	Target	1,430	6.1
pencil case; Fun d Mentals	Kmart	197	25.6
placemat; Warner Bros. Space J.	Kmart	178	7.9
placemat; Barth & Dreyfuss	Kmart	398	6.2
placemat; Gloria Vanderbilt	Wal-Mart	505	12.0
purse; Pacific Kids	Wal-Mart	349	104.8
rain hat; Warner Bros. Tweety	Warner Bros.	4,060	35.4
rain coat; Columbia Youth Parka	Uncle Dan's	22,550	47.9
shower curtain; Springs Bath	Wal-Mart	864	105.5
tent pole; Barbie Slumber	Toys R Us	6,105	14.6
totebag; Tweety	Wal-Mart	459	228.5
toy; Looney Tunes hackey sack	Toys R Us	1,610	nd
toy; Kentucky Fried Chicken	Toys R Us	207	344.0
toy; Toteables cosmetics pouch	Target	392	152.0
toy; Dimples doll stroller	Toys R Us	7,115	22.6
umbrella; Looney Tunes	Toys R Us	817	27.0

Abbreviations: ppm, parts-per-million by weight in product; nd, not determined. All products shown were purchased in Chicago, Illinois. A representative sample of these products contained lead in cities throughout the U.S. See Results and Discussion for data and information regarding other cities. The Consumer Product Safety Commission staff-recommended limit for lead in vinyl is 200 ppm. Cadmium is not regulated by the Consumer Product Safety Commission. Proposition 65 regulates cadmium at one-tenth the level set for lead. Results shown are averages of duplicates. The average coefficient of variation was 9% and 22% for lead and cadmium respectively.

Vinyl Products in California Contain Lead and Cadmium

Since lead and cadmium are stringently regulated in the state of California, a representative sample of the Chicago vinyl products was purchased in San Francisco and Los Angeles and tested for the presence of lead and cadmium. Table 2 shows that the same pattern of lead and cadmium content that was observed in products from Chicago was seen in those from California. Seventeen different vinyl products contained between 180 and 7,780 ppm lead. More than 80% of the products violated the Consumer Product Safety Commission staff-recommended limit of 200 ppm lead in vinyl.

Though cadmium is more stringently regulated than lead in California, its presence was ubiquitous in items containing lead. In a few cases, the levels of cadmium rivaled or even exceeded the lead levels. The Disney Minnie Mouse backpack, Kmart 101 Dalmations backpack, Barbie backpack, shower curtain, and Kentucky Fried Chicken toy contained extremely high amounts of cadmium (Table 2). Each gram of the items contained between 235 and 650 µg cadmium even though they were purchased in a state that only permits 0.05 µg exposure to cadmium dust per day.

Agency	Lead	Cadmium
Consumer Product Safety Commission	paint: 600 ppm vinyl: 200 ppm*	not regulated
State of California	0.05 µg/day	0.05 µg/day inhalation

Abbreviations: ppm, parts-per-million by weight in product. *Proposed by Consumer Product Safety Commission staff following discovery of lead in vinyl blinds.

Disney, Warner Bros. and Mattel products contain toxic metals

Ironically, many of the California products containing lead and cadmium also featured children's icons of several California-based companies including Disney, Mattel, and Warner Bros. Backpacks featuring Minnie Mouse and 101 Dalmations containing both lead and high amounts of cadmium were available at the Disney Store and Kmart in Los Angeles and San Francisco respectively. Mickey Mouse is prominently featured on a children's key ring containing over 240 ppm lead. Mattel's Barbie is featured on a backpack containing over 400 ppm lead and 200 ppm cadmium. Barbie is also featured in a children's slumber tent that contains tent poles with 4,685 ppm lead in Los Angeles and 7,400 ppm lead in a tent purchased in San Francisco. Warner Bros. was also represented among lead-containing vinyl products for children. A rain hat containing over 2,700 ppm lead and featuring Tweety was purchased in the Warner Bros. store in both California cities. A Looney Tunes hackey sack contained either over 300 ppm lead in Los Angeles or over 1,600 ppm lead in San Francisco. A Space Jam placemat featuring Michael Jordan contained 180 ppm lead. Finally, a Looney Tunes children's umbrella available in

Los Angeles and San Francisco contained over 650 ppm lead and 50 ppm cadmium in both cities. None of the products contained labels warning California consumers and children about the presence of either lead or cadmium.

Table 2. Lead and Cadmium in Vinyl Consumer Products Purchased in California

Item	Store	Lead (ppm)	Cadmium (ppm)
backpack; Minnie's Spring Fever	Disney; LA	263	242.0
backpack; Minnie's Spring Fever	Disney; SF	255	238.5
backpack; 101 Dalmations	Kmart; LA	226	499.0
backpack; 101 Dalmations	Kmart; SF	288	440.0
backpack; Barbie	Kmart; SF	417	242.0
barbell; 2lb vinyl cover	Target; SF	7,780	7.2
cable; Sega Controller	Toys R Us; SF	4,755	14.1
cable; Gemini 3' video coaxial	Kmart; LA	4,910	9.6
cable; Gemini 3' video coaxial	Kmart; SF	6,965	24.3
cable; Gemini mod. phone cord	Kmart; LA	679	6.8
cable; Gemini mod. phone cord	Kmart; SF	5,290	36.7
cable; Philco in-ear headphones	Kmart; LA	5,910	5.6
cable; Philco in-ear headphones	Kmart; SF	4,700	27.3
key ring; Disney Minnie Totes	Target; SF	242	17.0
placemat; Warner Bros. Space J.	Kmart; LA	180	6.9
rain hat; Tweety	Warner Bros.; LA	2,755	39.0
rain hat; Tweety	Warner Bros.; SF	2,835	51.5
shower curtain; Springs Bath	Wal-Mart; LA	477	425.0
tent pole; Barbie Slumber	Toys R Us; LA	4,685	11.8
tent pole; Barbie Slumber	Toys R Us; SF	7,400	8.3
toy; Looney Tunes hackey sack	Toys R Us; LA	316	45.1
toy; Looney Tunes hackey sack	Toys R Us; SF	1,675	53.9
toy; Kentucky Fried Chicken	Toys R Us; LA	125	649.0
toy; Kentucky Fried Chicken	Toys R Us; SF	110	363.5
umbrella; Looney Tunes	Toys R Us; LA	656	46.7
umbrella; Looney Tunes	Toys R Us; SF	695	50.3

Abbreviations: ppm, parts-per-million by weight in product. LA, Los Angeles, CA; SF, San Francisco, CA. Results shown are averages of duplicates. Average coefficient of variation was 14% and 16% for lead and cadmium respectively. The Consumer Product Safety Commission staff-recommended limit for lead in vinyl is 200 ppm. Cadmium is not regulated by the Consumer Product Safety Commission. Proposition 65 regulates cadmium at one-tenth the level set for lead.

Pilot Study in Canada Confirms the U.S. Pattern

A small pilot study to determine whether vinyl products in Canada might also contain lead and cadmium was conducted by examining thirteen items purchased in Montreal, Quebec. Eight of the thirteen items contained significant amounts of lead (Table 3). The products included popular children's characters like 101 Dalmations, Barbie, and Minnie Mouse. Table 3 shows that half of the items violated the 600 ppm standard currently in use in Canada. Health Canada is proposing a 15 ppm limit for lead in children's and other consumer products. The 101 Dalmations and Barbie backpacks, Sega Genesis cable, and Columbia rain coat all contained lead as discovered in various U.S. cities (Table 3). The items also contain cadmium as discovered in the U.S. sampling. A Minnie Mouse poncho, 101 Dalmations backpack, and waterproof jacket all contained greater than 45 ppm cadmium. As in the U.S., all the lead- and cadmium-containing items were readily available at common chain stores.

Table 3. Lead and Cadmium in Vinyl Products Purchased in Montreal

Item	Store	Lead (ppm)	Cadmium (ppm)
backpack; 101 Dalmations	Toys R Us	110	55.0
backpack; Barbie	Toys R Us	610	4.0
barbell; 2lb vinyl cover	Sports Experts	247	29.0
cable; Sega Controller	Toys R Us	5,415	6.0
jacket; black waterproof	Zellers	234	143.0
poncho; Minnie Mouse	Wal-Mart	99	46.0
rain coat; Columbia	Sports Experts	18,600	8.0
rain pants; Columbia	Sports Experts	18,750	18.0

Abbreviations: ppm, parts-per-million by weight in product. Results shown are averages of duplicates. Average coefficient of variation was 14% and 15% for lead and cadmium respectively. The limit for lead in consumer products currently used in Canada is 600 ppm. Health Canada is currently proposing a 15 ppm limit for lead in children's and consumer products.

A National Problem in the United States

To determine whether lead in vinyl consumer products represented a national problem, a representative sample of the Chicago items was purchased in a variety of U.S. cities and analyzed for lead. The U.S. cities were: Boston, MA, Boulder, CO, Chicago, IL, Los Angeles, CA, Minneapolis, MN, New Orleans, LA, New York, NY, Portland OR, San Francisco, CA, Seattle, WA, and Washington, D.C. The results indicate that vinyl consumer products containing hazardous lead levels are widely available throughout the United States and in at least one major Canadian city (Table 4). Not all of the items were available in every city, but Table 4 (below) shows that items originally found to contain lead in Chicago also contained lead in every city examined. Seventeen of the 19 items averaged greater than the 200 ppm standard recommended by the Consumer Product Safety Commission staff. The results also show a large variation in lead content throughout the U.S. and even in different cities within the same state. This is surprising considering that almost all of the products were purchased at national chain stores like Kmart, Wal-Mart, Target, and Toys R Us. The data suggests that a low lead or cadmium level in one city may not guarantee the safety of the same product purchased in a different store, city, state, or country.

Table 4. Lead in Vinyl Products Purchased in Various Cities

Item	Avg Lead (ppm)	Low (ppm)	High (ppm)	n	%	Cities
backpack; Minnie's	286	132	637	9	49	Bos, Chi, LA, Min, SF
backpack;. 101 Dalm	198	97	374	19	19	Bos, Bou, Chi, LA, NO, SF, DC, Mon, Min,
backpack; Barbie	417	236	627	8	33	Chi, SF, Mon, DC
barbell; 2lb vinyl	5,271	824	8,610	6	67	Chi, SF, Sea
cable; Sega Genesis	5,045	2,490	7,160	15	21	Bos, Chi, Mon, NO, NY, SF, DC
cable; Gemini video	6,803	4,250	12,600	17	30	Bos, Chi, LA, NO, NY, SF, Sea, DC
cable; Gemini phone	2,130	393	5,350	13	91	Chi, LA, NO, NY, SF, DC
cable; Philcoin-ear	4,845	3,610	6,150	13	18	Bos, Chi, LA, NO, SF, Sea, DC
cable; AT&T phone	4,203	207	7,260	6	76	Bos, Chi, Sea
key ring; Disney	836	234	1,570	4	83	Chi, SF placemat;
Space Jam	244	126	426	14	41	Bou, Chi, LA, Min, Sea, DC

rain hat; Tweety	2,631	680	4,200	8	49	Bos, Chi, LA, SF
rain coat; Columbia	23,211	16,800	28,600	9	15	Bos, Chi, LA, Mon, Por, Columbia
shower curtain; Spr	665	445	889	12	27	Bos, Bou, Chi, LA, Min, NO, Sea, DC
tent pole; Barbie	5,962	2,830	12,500	17	41	Bos, Bou, Chi, LA, NO, SF, Sea, DC
totebag; Tweety	679	409	1,093	4	45	Bos, Chi
toy; L. Tuneshackey	1,774	190	7,490	8	136	Bou, Chi, NO, SF, DC
toy; KFC	177	97	420	12	50	Bos Chi, LA, Sea, SF, DC
umbrella; L.Tunes	661	416	852	147	19	Bos, Chi, LA, NO, NY, SF, Sea, DC

One item from each city was tested. Abbreviations: Cev, coefficient of variation, the standard deviation expressed as a percent of the mean; Bos, Boston, MA; Bou, Boulder, CO; Chi, Chicago, IL; LA, Los Angeles, CA; Mon; Montreal, Quebec, Canada; Min, Minneapolis, MN; NO, New Orleans, LA;NY, New York, NY; Por, Portland, OR; SF, San Francisco, CA; Sea, Seattle, WA; DC, Washington, D.C.

Lead and cadmium as ingredients in vinyl

The overall variation in lead and cadmium levels seen in the various consumer products could occur for various reasons. Since metal stabilizers are typically added at levels greater than 5,000 ppm, vinyl items containing high amounts of lead are probably stabilized with it. Items with lower amounts of lead may reflect contamination in the manufacturing process. In addition, cadmium and lead are both used in pigments that color vinyl. Items colored with these pigments could also contain high amounts of either metal. Unfortunately, vinyl always requires some sort of metal stabilizer to protect the plastic during processing due to the presence of chlorine in the polymer (see Appendix IV). This structural obligation for metal stabilizers makes the prospect of making a "clean" vinyl product doubtful.

Absorbing Lead from Chewing and Swallowing Vinyl

The chewing and swallowing behavior of children is a common source of lead exposure. However, swallowing is not even necessary for exposure. Simply chewing and sucking on plastic cables is a known source of lead poisoning. [10] Three commonly chewed products were incubated under mild acid conditions at body temperature using Consumer Product Safety Commission protocols. The experiment explored whether ingesting even a tiny amount of a Gemini phone cord, Disney Minnie Totes key ring, or Kentucky Fried Chicken toy could pose a risk.

The results show that swallowing less than one-hundredth of an ounce of vinyl would release measurable quantities of lead. In fact, Table 5 (below) shows that all three items exceeded the ingestion limit used by the Consumer Product Safety Commission (15 µg/day). The agency limit is 30 times higher than the maximum ingestion level permitted in California under Proposition 65. The Commission uses it despite acknowledging that "..any ingestion of lead is undesirable because the effects of lead ingestion are cumulative, and other sources of lead may be available to children…." [11]

Table 5. Migration of Lead Under Conditions That Mimic Swallowing 250 µg of an Item (0.00881 ounces)

Item	Store	Available Lead (µg)
cable; Gemini modular phone cord	Kmart	21.6
key ring; Disney Minnie Totes	Target	34.2
toy; Kentucky Fried Chicken	Toys R Us	23.0

Abbreviations: µg, micrograms. All products were purchased in Chicago, Illinois. Items treated using Consumer Product Safety Commission protocols for extractable lead as described in Appendix V. The permitted exposure level for lead under California's Proposition 65 is 0.5 µg/day.

The data also demonstrates that swallowing less than one-thousandth of an ounce of any product in Table 5 would release enough lead to exceed the legal exposure limit of Proposition 65 by more than four-fold. The lead migration displayed by the vinyl Kentucky Fried Chicken is especially disturbing since the toy is actually designed to be put into children's mouths.

Contaminated dust is a health risk

Lead- or cadmium-contaminated dust is especially hazardous since it can easily enter the body in multiple ways. Routes of ingestion include licking, sucking, mouthing, inhalation, and hand-to-mouth behavior. Since real life behaviors encompass multiple exposure pathways, the data showing the presence of surface lead and cadmium was not confined to a specific route of ingestion. Instead, the results show the total amount of lead or cadmium that is available for ingestion on the product surface. Metals which are not

ingested immediately can become part of the indoor environment and be ingested later by the same variety of pathways.

Table 6 (below) shows that lead dust was measured on the surfaces of seven products right out of the package. Lead levels on six products exceeded the Proposition 65 limit by 4 to 470 fold. Five of these products were purchased in California. More than half of the items contained lead dust at levels similar to, or greater than the Consumer Product Safety Commission ingestion limit.

Table 6. Lead and Cadmium Dust Present on New Vinyl Children's Products: Exposures Provided by Average Products

Item	Store	Lead (µg)	Cadmium (µg)
backpack; Minnie's Spring Fever	Disney; LA	1.984	nd
backpack; 101 Dalmations	Kmart; LA	19.430	1.740
backpack; Barbie	Kmart; SF	14.210	1.160
rain coat; Columbia	Columbia; Por	235.733	nd
rain hat; Tweety	Warner Bros.; LA	9.217	nd
tent pole; Barbie Slumber	Toys R Us; SF	13.404	nd
totebag; Tweety	Wal-Mart; Chi	0.240	nd

Abbreviations: µg, micrograms; nd, not detected. LA, Los Angeles, CA; SF, San Francisco, CA; Por, Portland, OR; Chi, Chicago, IL. Average exposures represent the mean of triplicates. The permitted exposure level for lead and cadmium under California's Proposition 65 is 0.5 µg/day and 0.05 µg/day respectively. Areas of products are as follows: Minnie's Spring Fever: 96 in [2]; 101 Dalmations: 290 in [2]; Barbie: 290 in [2]; Columbia: 1,700 in [2]; Tweety rain hat: 79 in [2]; Barbie Slumber: 36 in [2]; and Tweety totebag: 240 in [2]

Vinyl products release toxic metals during degradation

Two children's products were made even more dangerous by the additional presence of cadmium. Table 6 shows more than 1.1 µg of cadmium present on the surfaces of new 101 Dalmations and Barbie backpacks in addition to greater than 14 µg of lead dust. The cadmium levels are more than 23 to 35 times higher than the amount permitted in California, where they were purchased.

Lead and cadmium were released as toxic dust during the degradation of vinyl children's products. Figure 1 (below) shows the rapid release of lead from a Barbie tent pole under conditions used by the Consumer Product Safety Commission to demonstrate the liberation of lead from vinyl miniblinds. Figure 2 (below) shows the increasing availability of cadmium on the surface of a 101 Dalmations backpack during aging. To our knowledge, Figure 2 represents the first demonstration of cadmium release from a vinyl consumer product during degradation.

Figure 1.

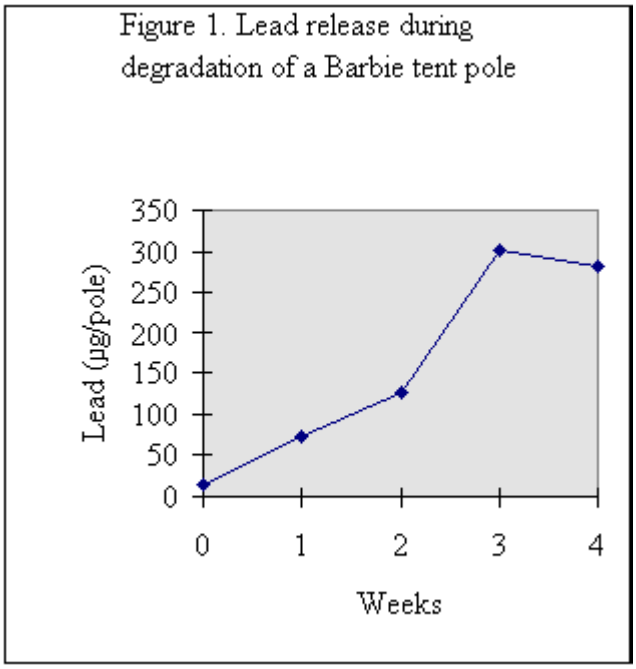
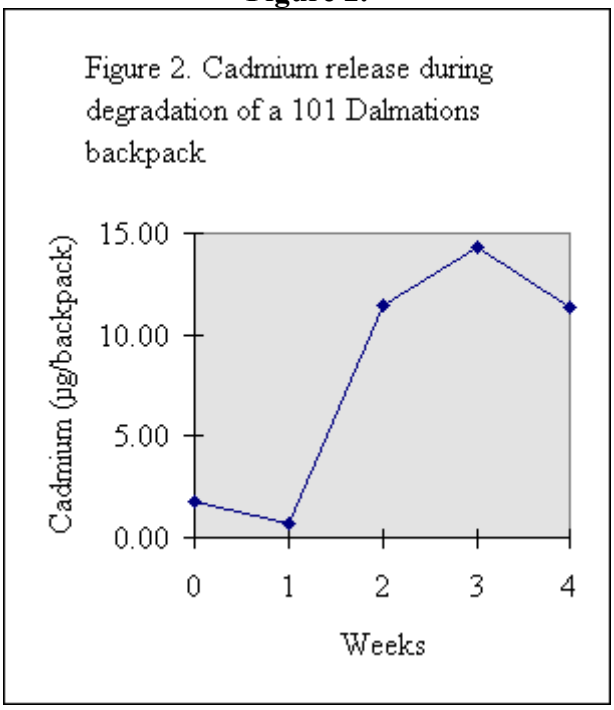


Figure 2.



Abbreviations: µg, micrograms. Average exposures representing the mean of triplicates were plotted for both figures. The permitted exposure level for lead and cadmium under California's Proposition 65 is 0.5 µg/day and 0.05 µg/day respectively

Large amounts of lead and cadmium are released

Large amounts of lead-contaminated dust were released by vinyl children's products during four weeks of accelerated aging. Table 7 (below) shows maximum surface lead levels between 5.6 µg and 336 µg. The lowest level occurred on the Disney Minnie's Spring Fever backpack. However, this backpack still produced more than 11 times the amount of lead legally permitted in California where it was purchased. The two highest amounts of lead dust were present of the surfaces of the Columbia rain coat and the Barbie Slumber tent pole. Both products released over 300 µg of lead dust; more than 600 times the Proposition 65 limit. In fact, all seven products violated the legal limit set by Proposition 65. Four of the products exceeded the limit used by the Consumer Product Safety Commission.

Table 7. Maximum Lead and Cadmium Dust Levels Observed on the Surfaces of Vinyl Products: Exposures Provided by Average Products

Item	Store	Lead (µg)	Cadmium (µg)
backpack; Minnie's Spring Fever	Disney; LA	5.664	5.792
backpack; 101 Dalmations	Kmart; LA	19.430	14.307
backpack; Barbie	Kmart; SF	35.380	23.393
rain coat; Columbia	Columbia; Por	336.033	nd
rain hat; Tweety	Warner Bros.; LA	9.217	0.263
tent pole; Barbie Slumber	Toys R Us; SF	302.484	nd
totebag; Tweety	Wal-Mart; Chi	8.800	15.520

Abbreviations: µg, micrograms; nd, not detected; ND, not determined. LA, Los Angeles, CA; SF, San Francisco, CA; Por, Portland, OR; Chi, Chicago, IL. Average exposures represent the mean of triplicates. The permitted exposure level for lead and cadmium under California's Proposition 65 is 0.5 µg/day and 0.05 µg/day respectively. See Table 6 for product areas.

The most dangerous 10% of items would provide significant exposures

Large amounts of easily ingestable cadmium dust were also released during degradation of vinyl children's products. Table 7 shows that the amount of cadmium released by all six products that were tested was 5 to 460 times higher than the Proposition 65 limit.

The use or presence of several vinyl products would further increase the amount of lead and cadmium available for ingestion. Table 7 shows that combining a Barbie backpack, Columbia rain coat, and Tweety rain hat, could quickly increase exposure to both toxic metals, especially if they were used multiple times each week or month. The hazard comes from the cumulative nature of lead poisoning. [12]

A statistical calculation revealed the amount of lead or cadmium that the most hazardous subset of product samples could provide. The estimate assumed a normal distribution and used the variation observed among replicates to calculate the 90th percentile level of

either metal. The most dangerous 10% of samples could provide at least this amount of lead or cadmium.

Table 8. Minimum Lead and Cadmium Exposures Provided by the Most Hazardous 10 Percent of Items: Statistical Estimate

Item	Store	Lead (µg)	Cadmium (µg)
backpack; Minnie's Spring Fever	Disney; LA	14.824	6.678
backpack; 101 Dalmations	Kmart; LA	24.284	15.852
backpack; Barbie	Kmart; SF	83.692	35.840
rain coat; Columbia	Columbia; Por	590.554	nd
rain hat; Tweety	Warner Bros.; LA	12.415	0.497
tent pole; Barbie Slumber	Toys R Us; SF	486.925	nd
totebag; Tweety	Wal-Mart; Chi	20.495	16.762

Abbreviations: µg, micrograms; nd, not detected; ND, not determined. LA, Los Angeles, CA; SF, San Francisco, CA; Por, Portland, OR; Chi, Chicago, IL. The 90th percentile was calculated by adding (z1.289 x sample standard deviation) to the mean. A normal distribution was assumed for the data set. The permitted exposure level for lead and cadmium under California's Proposition 65 is 0.5 µg/day and 0.05 µg/day respectively. See Table 6 for product areas.

Table 8 shows that the most hazardous samples of each product would provide exceptional exposures to both toxic metals. The only product which did not liberate cadmium was the Columbia rain coat. The most dangerous 10% of these rain coats would provide nearly 1,200 times the legal limit for lead set by Proposition 65 and 40 times the limit used by the Consumer Product Safety Commission. Cadmium was not measured on the Barbie tent pole, but this product could liberate 970 times the amount of lead permitted by Proposition 65.

The remaining 5 products contained both toxic metals on their surfaces. Lead levels ranged from 25 to 170 times higher than the Proposition 65 limit. Cadmium levels exceeded the limit by 10 to 335 fold. The presence of both lead and cadmium on the product surface represents a significantly greater hazard than the considerable danger posed by either toxic metal alone.

Appendix 1:
Lead and Cadmium Toxicity, Exposure, and Regulation

Lead poisoning is a significant health problem

Lead poisoning is widely recognized to be one of the most serious preventable public health hazards in the U.S. [13] In the period from 1991 to 1994, 890,000 children had blood lead levels defined as lead-poisoned. [14] In addition, a national phone survey in 1994 showed that only 24% of parents had screened their young children for lead, indicating that the true magnitude of the problem may be much larger. [15]

Lead causes irreversible nervous system damage and decreased intelligence at extremely low doses. [16,17] Children are especially susceptible to lead poisoning because they absorb and retain more lead in proportion to their weight than adults. [18] Lead exposure in childhood has been associated with lower vocabulary and grammatical-reasoning scores, increased absenteeism, poorer eye-to-hand coordination, and lower class standing in high school. [19] Unfortunately, most children with lead poisoning are not overtly symptomatic. [20]

Defining the hazard

What is considered a "safe" level of lead by the medical community has declined significantly over the last thirty years. In the 1960s the Centers for Disease Control (CDC) action level for lead in blood was 60 µg/dl. This lead level results in mental retardation, kidney damage, male infertility, impaired growth, and hearing loss. [21] A decade later the medical community lowered the level to 30 µg/dl. In 1985, the action level dropped to 25 µg/dl and in 1991 it was modified downward to 10 µg/dl.

Current blood level standards for lead do not protect children. Even though 10 µg/dl is considered "safe" by some medical professionals, reduced birthweight, hearing loss, and attention deficit in children and monkeys have been observed at blood lead levels of 5 µg/dl. [22] In fact, recent analyses of lead exposure and children's IQ could find no evidence of a threshold, suggesting that there is no safe lead level and that the current 10 µg/dl standard permits nervous system damage. [23] Blood lead levels in preindustrial humans were estimated from bone measurements to be 0.016 µg/dl. [24] The current "safe" level of 10 µg/dl is 600 times higher than natural concentration of lead in blood.

Exposure to lead

One of the largest sources of lead exposure in the U.S. is lead-contaminated dust. A common source is decaying paint that contaminates house dust and soil. [25] The permitted lead level in residential paint in the U.S. was lowered to 600 ppm in 1978 but a huge reservoir of leaded paint in older housing stock continues to pose a hazard. Recalls

are normally implemented when painted consumer products contain greater than 600 ppm lead. However, each product or source of lead is regulated separately. This allows for exposures from a variety of sources, all of which might be below the particular regulatory level. [26] The health hazard comes from the cumulative nature of lead poisoning. [27]

Lead ingestion and poisoning typically occurs by licking, mouthing, or swallowing the item, through hand-to-mouth activity, or inhalation. Both hand-to-mouth activity and mouthing were indicated in the lead poisoning cases caused by vinyl blinds. [28] Inhalation and hand-to-mouth activity have been implicated in the lead poisoning of plastics workers. [29,30,31] Finally, chewing on plastic-covered electrical cables was also identified as a source of lead intoxication. [32]

California and lead regulation

The most stringent regulation of lead in consumer products is in the state of California. The Safe Drinking Water and Toxic Enforcement Act of 1986 (also known as Proposition 65) regulates chemicals known to cause cancer or reproductive toxicity. Lead qualifies under both categories. The law regulates chemicals by requiring clear warning labels on products containing hazardous amounts of toxins and by prohibiting businesses from dumping listed chemicals onto the land or into water. The maximum acceptable intake level of lead under Proposition 65 as a reproductive and developmental toxin is 0.5 μg/day. This represents 0.8 millionths of an ounce of the children's Columbia rain coat in Table 1. The California lead level was adopted in 1987. It was determined by dividing the Occupational Safety and Health Administration (OSHA) limit of 500 μg/day by a 1,000-fold safety factor as required under the law. [33]

California and cadmium regulation

The State of California also recognized cadmium as a carcinogen under Proposition 65 in 1987. [34] The no-significant risk level for inhaled cadmium dust was set at 0.05 μg/day, one-tenth the level set for lead. The standard was based upon studies demonstrating an association between cadmium and respiratory cancer in both humans and laboratory animals. [35] Injection of cadmium in animals produced tumors both at the site of injection and at other sites including testicular interstitial cells and pancreatic islet cells. [36]

Cadmium was also recently nominated for listing as a reproductive toxin under Proposition 65. [37] Cadmium was positively correlated with reduced birthweight, premature birth, stillbirth, spontaneous abortion, and birth defects in humans. [38] In addition, cadmium and lead were both correlated with behavioral problems and learning disabilities. In utero exposure to both lead and cadmium was correlated with motor and perceptual problems in six year old children. [39] Since cadmium can be absorbed orally, by inhalation, or even by dermal contact, the lack of regulation in children's products by the Consumer Product Safety Commission is surprising.

Incineration and exposure to lead and cadmium

Incineration also represents a potentially significant source of lead and cadmium exposure. The ash produced by municipal waste incinerators contains both toxic metals. [40] In addition, both metals can be inhaled from combustion gases or ingested since they are easily leached out of ash into soil or water. [41] The EPA estimated that plastic contributes 71% of the lead and 88% of the cadmium in the combustible portion of the municipal waste stream. [42] This combustible portion of municipal waste is the major contributor to toxic air emissions and ash. [43] Both metals have been used as stabilizers and pigments in vinyl production for decades.

The final destination for lead- and cadmium-containing consumer products is the trash. This provides another legal avenue for exposure to both toxic metals. Currently, existing municipal waste combustors that process 1,000 tons per day are permitted to release 18 g/million dry standard cubic feet of cadmium and 200 g/million dry standard cubic feet of lead. A typical incinerator releases 3,670 dry standard cubic meters at 7% oxygen per ton of unprocessed municipal solid waste. [44] Therefore, an existing municipal waste incinerator of this size can legally emit 2,334 g of cadmium and 25,921 g of lead each day. For new incinerators the regulations are more "stringent". A 1,000 ton per day municipal waste incinerator can release 1,127 g of cadmium and 11, 274 g of lead per day. Assuming an 8,000 hour operating year, an existing 1,000 ton per day incinerator can legally emit 1,713 pounds of cadmium and 19,032 pounds of lead per year. A new incinerator of this size is permitted to emit 826 pounds of cadmium and 8,278 pounds of lead annually.

Prevention is the key

Lead poisoning is both extremely serious and preventable. The American Academy of Pediatrics has stated that, "Identification and treatment of the child poisoned with lead continues to be essential, but of greater importance is *identification of the source and prevention of subsequent exposures* for that child and other children in the future." [45] One overlooked source of lead (and cadmium) is vinyl consumer products. Fortunately, there are alternative materials for all consumer uses of vinyl. Parents can prevent toxic metal exposure to their children by returning vinyl items and buying products made of alternative materials.

Appendix 2:
Why Greenpeace Decided to Investigate Lead in Vinyl Products

Vinyl blinds as a source of lead

In 1996, the Arizona, North Carolina, and Virginia Departments of Health discovered unexplainable hazardous lead levels in children. The results were puzzling due to the lack of lead-based paint as an explanation for the poisoning. In the original Arizona case, a 1-½ year old lead-poisoned child lived in a trailer that did not even have interior paint. [46] The investigation unexpectedly yielded vinyl miniblinds as the common source of lead dust. The mere presence of lead in vinyl blinds was surprising to the public even though it has been widely used as an additive in vinyl to retard decomposition since the 1950s.

An investigation by the Consumer Product Safety Commission revealed that ultraviolet (UV) light-degradation of the blinds caused the release of lead dust which was apparently subsequently ingested by children. [47] The agency found that new vinyl miniblinds contained from 7,700 to 12,300 parts-per-million (ppm) total lead. [48] In contrast, the limit for lead in painted toys and consumer products has been 600 ppm since 1978. [49]

Deterioration and toxic dust

The Consumer Product Safety Commission conducted accelerated aging experiments to demonstrate whether the lead in vinyl blinds could become available as dust as the blinds deteriorated in the sun. Blinds were exposed to UV light and heat over a period of eight weeks. During exposure, increasing levels of surface dust containing lead were measured on the blinds. [50] The results indicated that normal product use could make lead dust available to children. The deterioration of the vinyl and subsequent availability of lead continued despite washing or cleaning indicating that consumers were vulnerable despite good housekeeping practices. [51]

The vinyl blinds produced a surprising amount of toxic lead dust. The Environmental Protection Agency (EPA) standard limits for lead dust used in risk assessment of homes are 500 µg/ft2 for window sills and 100 µg/ft2 for floors. [52] In sharp contrast, lead levels over 14,000 µg/ft2 were found on some blinds. [53] In Arizona, lead levels in all ten samples exceeded 100 µg/ft2. [54] Seven of the ten samples had levels greater than 500 µg/ft2. [55] In North Carolina, lead levels exceeded 100 µg/ft2 in 45 of the 56 samples. [56] About half of the samples contained greater than 500 µg/ft2 lead. [57] The vinyl blind sample with the highest level contained 66,440 µg/ft2 lead dust. [58]

Vinyl blinds as a health risk

Lead-containing vinyl blinds represent a potentially significant health risk. Blood levels of lead greater than the 10 µg/dl action level triggered the investigations in which blinds

were identified as the source of poisoning. Elevated blood lead levels in exposed children ranged from 17 to 58 μg/dl. A total of 31 lead-poisoned children in three states were investigated in the Consumer Product Safety Commission study. However, the agency estimated that 25 million vinyl miniblinds containing lead are imported into the U.S. each year. [59] Taken together, the data suggests that lead poisoning due to vinyl blinds may be a significant preventable health problem in the U.S.

Publicity and response

Greenpeace and several other environmental organizations publicized the health risks associated with the vinyl blinds. Greenpeace wrote letters informing all the State Departments of Health in the U.S. about the situation and contacted over 200 retailers. Local TV stations also picked up the story. The Chicago NBC affiliate, WMAQ, purchased ten different brands of vinyl blinds in Chicago and found lead levels between 940 ppm and 11,000 ppm.

Despite the publicity surrounding the health risk, the Consumer Product Safety Commission never issued a product recall of vinyl miniblinds. Instead, the agency entered into a dialog with the Window Covering Safety Council, the trade association of manufacturers. Initially, the industry group suggested that production be altered to meet the 600 ppm level specified for lead in paint under the Consumer Product Safety Act. [60] Despite the well-known toxicity of lead, the Window Covering Safety Council stated that "The industry is undertaking this program voluntarily understanding that there has been only cursory evaluation of the health risks of vinyl blinds to the public." [61]

A standard for lead in vinyl

In response to the trade association, the Consumer Product Safety Commission staff proposed a lower standard of 200 ppm lead in vinyl blinds and urged the industry to reduce lead content to the lowest level possible. [62] The trade association responded that, "The industry will work with the Consumer Product Safety Commission to develop an appropriate specification for vinyl window coverings through an accredited national standards organization, such as ANSI." [63] No specification currently exists.

In a follow-up memo the Consumer Product Safety Commission reiterated the position that lead levels below 200 ppm were technologically feasible. [64] In addition, the Consumer Product Safety Commission reminded the industry group that "…it is the responsibility of each manufacturer/importer to assure that the lead substitutes and other chemicals used in the manufacture of vinyl miniblinds do not present a hazard to consumers." [65]

The Consumer Product Safety Commission action and industry response were carried out quietly with no public attention. The agency never issued a mandatory standard for lead in vinyl blinds despite the 200 ppm level proposed by their own staff. Instead, the agency stated that "Because companies are discontinuing the use of lead, no standard appears to be needed." [66] Unfortunately, the situation was different on the retail level.

The sale of a product containing lead is tolerated

The Consumer Product Safety Commission instructed retailers to place warning labels on brands known to contain lead but the recommendation was not enforced. Greenpeace found unlabeled, lead-containing miniblinds in Kmart stores across the U.S. several months after the Consumer Product Safety Commission declaration. The lead-containing blinds were sold at deep discounts during the 1996 Labor Day Sale. It appears that vinyl blinds represent the first lead-containing consumer product whose sale was tolerated by governmental authorities, manufacturers, and retailers despite the demonstrated health risks to children.

Legal action in California

The State of California response to lead-containing vinyl blinds was more protective than the actions taken by the Consumer Product Safety Commission. Instead of issuing a recommendation, the state Attorney General, Dan Lungren, and Alameda County District Attorney, Tom Orloff, filed suit against 12 companies that made or sold the blinds since they failed to warn consumers as required by law. [67] The defendants included well-known national chains like Wal-Mart, Kmart, J.C. Penney, and Montgomery Ward & Co.

The lead content of all vinyl products remains unregulated even though lead poisoning causes irreversible nervous system damage to both children and adults. Cadmium has never been regulated by the Consumer Product Safety Commission despite its well-known carcinogenicity and kidney toxicity. Despite the clear health risk demonstrated by vinyl blinds, a Greenpeace follow-up evaluation revealed that no public agency appeared to be investigating other vinyl products to determine whether they might pose a similar health hazard as the miniblinds. Greenpeace initiated a study of lead in vinyl consumer products and found that vinyl blinds represent the tip of a much larger toxic iceberg.

Appendix 3:
Regulation of Lead in Vinyl

The adverse health effects of lead prompted a proposal for a specification limit in vinyl blinds. The Consumer Product Safety Commission staff recommended a lead limit of 200 ppm. The proposal was based on a maximum allowable ingestion limit of 15 m g/day lead, the surface area of half a hand of a typical child, and an assumption about vinyl degradation and subsequent availability of lead dust. The authors pointed out that "Staff believes that any ingestion of lead is undesirable because the effects of lead ingestion are cumulative and other sources of lead may be available to children, the staff urges the manufacturers to use the lowest amount of lead below 0.02% that is technologically feasible." [68]

The protection provided by the 200 ppm (0.02%) lead limit is questionable. To calculate the limit, the agency assumed a maximum allowable lead ingestion level of 15 µg/day. This is thirty times higher than the maximum level permitted in the state of California. In order to determine the likelihood of dust ingestion, the Consumer Product Safety Commission confined the exposure pathway to hand-to-mouth behavior. This presumes that the lead dust on blinds is somehow safe unless a child's hand touches them. Unfortunately, instead of disappearing, lead dust probably becomes part of the indoor environment. Failure to consider the fate of high levels of lead-contaminated dust inside a room underestimates the possible exposure and permits calculation of a more lenient specification limit.

The hand-to-mouth exposure scenario provided a method for calculating a maximum dust limit. The agency used anthropometric data to calculate the area of a typical child's hand between 2 and 6 years old. However, instead of using the area of both hands to determine possible dust exposure, the agency used half the area of only one hand. This means that a child might actually be exposed to four times the amount of lead dust the agency staff used in their calculation to determine the "safe" level. The staff then used this area to calculate the maximum dust limit that would maintain ingestion equal to or less than 15 µg/day. The agency proposed a lead dust limit of 3 µg/in2, roughly equal to the EPA limit for windowsills of 3.472 m g/in2 (500 µg/ft2).

Finally, the Consumer Product Safety Commission used an association between total lead content of a vinyl blind and the amount of lead dust produced by a blind to arrive at a specification limit. Since the average total lead content was 6,900 ppm (0.69%) and the average lead dust level among the highest samples was 123 µg/in2, an availability factor could be calculated assuming that all blinds degrade in a similar manner. The average dust level was 41 times higher than the suggested dust limit. Therefore, the agency divided the average total lead content of a blind by 41 (6,900/41) to yield 200 ppm lead as the standard.

A more protective specification limit could have been calculated using different assumptions and standards. Simply calculating the specification using the width of a

whole hand instead of half a hand would cut the limit in half to 100 ppm. Performing the calculation using two hands instead of one would have further reduced the limit to 50 ppm. Using the maximum permissible lead ingestion limit of 0.5 μg/day as mandated by California law would lower the specification from 200 ppm to 6 ppm even if only half of one hand was used in the calculation. The irreversible, cumulative health risks posed by lead poisoning warrant a more protective limit for lead in vinyl than 200 ppm.

Appendix 4:
Stabilizers in PVC

Polyvinyl chloride (PVC) requires the addition of stabilizers to prevent degradation because it contains chlorine. Small faults in the polymer chain can serve as starting points for degradation. During the obligatory heating steps of PVC processing, chlorine can leave the polymer chain and combine with hydrogen to form corrosive hydrogen chloride which further degrades the polymer. At the same time, double bonds are formed in the polymer. As the process proceeds the polymer loses increasing amounts of hydrogen chloride and forms increasing numbers of double bonds. [69] A positively charged metal can act as a stabilizer by stabilizing bound chlorine and binding free hydrochloric acid, thereby effectively neutralizing it and preventing further damage to the polymer. Common heat stabilizers in PVC formulation include lead and mixed metal soaps containing barium, calcium, zinc, and cadmium, and organotin compounds.

Lead historically has been used as a cheap, effective stabilizer of PVC since the 1950s. From a chemical perspective, it is useful in both rigid and flexible PVC products and in electrical cables due to its electrical properties as demonstrated by its presence in Sega Genesis cables, video cables, computer cables, and headphone cables.(Table 1)

Mixed metal soaps like barium/cadmium, barium/zinc, and calcium/zinc act as stabilizers by replacing reactive chlorine atoms with less reactive atoms or groups. [70] In a barium/cadmium soap a carboxylate group substitutes for chlorine which reacts with cadmium forming cadmium chloride. The cadmium chloride then reacts with barium forming barium chloride and regenerating the cadmium metal soap. The other soaps operate in a similar manner. Unfortunately the least toxic metals make the poorest, most expensive stabilizers. Calcium/zinc stabilizers provide less long-term stability than those containing toxic cadmium or lead. [71] To solve this problem, organotins have been introduced as PVC stabilizers. While reasonably effective, the immunotoxicity of some organotins in animals has raised concerns about their effects in humans. [72,73] Organotins are also known endocrine disruptors. [74]

In addition, the substitution of organotins illustrates a common corporate strategy. When consumer or regulatory pressure threatens a toxic additive, manufacturers can delay regulation and maintain profitability by substituting an additive that has not been rigorously tested for health and environmental impacts. Organotins are poorly characterized and therefore make good candidates for this strategy. By the time the additive is demonstrated to be hazardous, another substitution can be made thereby maintaining both corporate profitability and possibly perpetuating consumer health risks.

Appendix 5:
Materials and Methods

Lead and cadmium measurements

The total lead and cadmium content of all items was measured using atomic absorption spectroscopy by Stat Analysis, Chicago, Illinois AIHA proficient, NIST/NVLAP accredited. Laboratory work was supervised by Benjamin Ruth, PhD Testing was conducted blind to prevent possible bias introduced by product recognition. Sample preparation proved to be an important determinant of variation. Complete ashing of samples in a Thermolyne 48000 muffle furnace at 480C for two hours helped reduce variation though some sample heterogeneity was observed. Nitric acid, hydrogen peroxide, hydrochloric acid and methylene chloride were reagent or analytical grade. A test tube acid digestion lead preparation procedure (AOAC 5.001-3) was combined with an organic digestion using analytical grade methylene chloride (NIOSH9076). Measurements were performed using a Varian SpectrAA200 atomic absorption spectrophotometer. All appropriate laboratory QA/QC procedures regarding standard curve tolerances were followed for all samples including use of blanks and matrix spikes every 10 samples and NIST reference standards.

Acid extraction tests

Acid extractability was performed using procedures developed by the Consumer Product Safety Commission. [75] Studies were conducted by Stat Analysis, Chicago, Illinois. A test portion of plastic material was mixed with a 50-fold mass of 0.07 N hydrochloric acid and agitated for one hour at 37C in the dark. The material was re-extracted for two hours and then a third time for three hours. All three fractions were combined and analyzed for lead content.

Accelerated aging tests

Accelerated aging tests were performed using procedures developed by the Consumer Product Safety Commission. [76] Studies were conducted by personnel at the Environmental Quality Institute at the University of North Carolina-Asheville, AIHA, ELLAP accredited. The project was supervised by Richard Maas, PhD, associate director of the Institute.

A weatherometer was constructed according to specifications given in ASTM G53 without the condensation features and validated by lab personnel for temperature stability and illumination. [77] Even though moisture is a significant agent in degradation of materials, dry conditions were used in these aging studies to permit observations under milder, more realistic conditions. Natural and accelerated aging can be correlated if sufficient numbers of variables are compared in both methods. [78] Ultraviolet lights identical to those used in the UVCON brand weatherometer were purchased from Atlas

Electric Devices Company, Chicago, Illinois. The wavelength output in the 295-365 nm region provides excellent correlation with natural sunlight and outdoor exposure.

Samples were exposed to alternating cycles of six hours duration. The heat and light cycle was conducted at 50C under ultraviolet light illumination in the UV-A region. The alternate cycle was conducted at room temperature without illumination. Samples were tested in triplicate in a single blind design to prevent possible bias caused by product recognition among lab personnel. Samples were wiped at weekly intervals. One Pace Wipe was used to wipe each sample ten times. Wipes were digested and analyzed to yield lead and cadmium content per area wiped.

Lead and cadmium determinations were performed by graphite furnace atomic absorption spectrophotometry (GFAAS) using two Thermo-Jarrel-Ash Model 11 or Model 12 spectrophometers with TJA Model 774 graphite atomizers. All appropriate laboratory QA/QC procedures regarding standard curve tolerances and standard additions were followed for all samples.

Study design

Vinyl items purchased in Chicago area national chain stores were tested for total lead at Stat Analysis, Chicago, Illinois. Stores included Disney, Kmart, Target, Toys R Us, Uncle Dan's, Wal-Mart, and Warner Bros. In addition to information provided by product labels, all items containing lead were verified by the laboratory as PVC plastic by the Bellstein test for chlorine. Products containing above 100 ppm lead were also tested for cadmium content. A representative sample of 19 lead-containing items was selected for purchase in other cities. Not every item was found in every city. The sample included soft vinyl of various thickness, PVC-covered cable, and rigid PVC. Toys, clothing, household items, and cables were all included in the sample. Cadmium testing was restricted to items from Chicago, Los Angeles, San Francisco, and Montreal, Canada to control cost. A smaller sample of 7 products was submitted in triplicate for accelerated aging experiments as described above. The sample included soft and rigid PVC products designed for use by children. Most of the items submitted for the accelerated aging study were purchased in California.

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Additional Resources for Information about Lead and Its Effects:

National Lead Information Center - (800) 424-LEAD
http://www.nsc.org/ehc/lead.htm

State of California Childhood Lead Poisoning Prevention Branch
http://www.childlead.com/

Alliance to End Childhood Lead Poisoning
http://www.aeclp.org/

What You Can Do:

Vinyl children's products contain lead and cadmium which can move from the product to child. They were purchased at Kmart, Wal-Mart, Target, and Toys R Us. Please contact the following retailers, distributors, manufacturers, elected officials, and regulatory agencies and demand that they remove vinyl products containing lead or cadmium from the market. In addition, include the following points:

- Lead irreversibly decreases intelligence in children. Cadmium can cause cancer and kidney damage.
- Popular children's characters should not be placed on vinyl products to entice children.
- The Consumer Product Safety Commission (CPSC) should prohibit the use of lead and cadmium in vinyl products and recall items containing either metal. (Also contact the CPSC at the address below and ask why they attempted to discredit this Greenpeace report.)
- The State of California should pursue legal action against retailers and manufacturers selling vinyl products that violate Proposition 65.
- Retailers and government agencies should consider the President's Executive Order to Reduce Environmental Health and Safety Risks to Children which asks agencies to ensure that new regulations or standards consider special risks to children.
- Government agencies should consider the Final Communiqué of the Summit of the Eight which makes a multinational commitment to reducing children's exposure to lead.

President Bush
White House
1600 Pennsylvania Ave. NW
Washington D.C.
20500
Ph: (202) 456-1111
Fx: (202) 456-2461
Email: president@whitehouse.gov

Consumer Product Safety Commission
Ann Brown, Chair
Washington D.C.
20207
Ph: (202) 638-2772
Fx: (202) 504-0359
toll-free: (800) 638-2772
www.cpsc.gov
Email: info@cpsc.gov

Attorney General, State of California
Daniel Lungren, Attorney General
Department of Justice
2101 Webster St. 12th Floor
Oakland, CA
94612
Ph: (510) 286-1364
Fx: (510) 286-4020

Toys R Us
Michael Goldstein, CEO
461 From Rd.
Paramus, NJ
07652-3114
Ph: (201) 368-5532
Fx: (201) 262-8443

Target
Robert Ulrich, CEO
Dayton Hudson Corp.
777 Nicollet Mall
Minneapolis, MN
55402-2004
Ph: (612) 370-6948
Fx: (612) 370-6565

Kmart Corp.
Floyd Hall, CEO
3100 W. Big Beaver Rd.
Troy, MI
48084-3004
Ph: (810) 643-1000
Fx: (810) 643-5249
Email: webmaster@kmart.com

Wal-Mart
David Glass, CEO
702 SW 8th St.
Bentonville, AR
72716-6209
Ph: (501) 273-4000
Email: letters@wal-mart.com

Disney
Michael Eisner, CEO
Walt Disney Consumer Products
3900 W. Alameda Ave.
Burbank, CA
91505-4316
Ph: (818) 567-5058
Fx: (818) 560-1930

Mattel Inc.
John W. Amerman, CEO
333 Continental Blvd.
El Segundo, CA
90245-5032
Ph: (800) 524-8697
Ph: (213) 524-2000
Fx: (213) 524-2745

Warner Bros. Consumer Products
George Jones, President
4000 Warner Blvd.
Burbank, CA
91522-0001
Ph: (818) 954-6000
Fx: (212) 956-2847

Early Responses to This Report:

Please read the detailed reactions to our report findings by the toy industry, the Consumer Product Safety Commission, and rebuttals of their statements by the University of North Carolina Environmental Quality Institute and Greenpeace.

"This is of interest to us. We'll certainly look into it."

California Deputy Attorney General Susan Fiering
Specialist in Proposition 65 cases
Quoted in the San Francisco Examiner, story written by Jane Kay
October 9, 1997, Page 1

"As a parent, I would try to reduce exposure to my children from these products."

Janet Phoenix, MD, MPH
National Lead Information Center
National Safety Council
Quoted in the San Francisco Chronicle, story written by Louis Freedberg
October 10, 1997, Page A3

"We don't manufacture these products but they do have our images on them, so we do feel responsible."

Barbara Brogliatti
Director of Corporate Communications
Warner Brothers
Quoted in the San Francisco Chronicle, story written by Louis Freedberg
October 10, 1997, Page A3

"It clearly calls for attention. It's an important warning."

Michael McCally, MD
Department of Community Medicine
Mount Sinai School of Medicine
Quoted in the Oakland Tribune, story filed
by the Associated Press
October 10, 1997, Page A13

"... it is highly imprudent to dismiss these children's products as significant sources of lead and cadmium exposure ..."

Environmental Quality Institute
University of North Carolina

"I think the (Consumer Product Safety Commission) should wake up and pay more attention to this."

Howard Hu, MD, MPH, ScD
Associate Professor of Occupational and Environmental Medicine
Harvard School of Public Health
Quoted in the San Francisco Examiner, story written by Jane Kay
October 9, 1997, Page 1

"I am concerned that CPSC's hurried response and the testing of only 11 products is inadequate to judge the potential hazard from these vinyl products ... If the [Greenpeace] results are independently substantiated, a recall of these vinyl products as well as older vinyl miniblinds may be in order."

North Carolina Department of Environmental Resources
Division of Environmental Health

"I view the Greenpeace findings as a warning clearly calling for further study and confirmation by other investigators ... If the CPSC [Consumer Product Safety Commission] actions were simply an effort to discredit the Greenpeace report I am diappointed."

Michale McCally, MD PhD
Mt. Sinai Hospital
Dept. of Community Medicine

"[The CPSC is] ... a public health agency, not a public reassurance agency. I'm afraid that this was not CPSC's shining hour."

David Ozonoff, MD, MPH
Chair
Department of Environmental Health
Boston University

"No heavy metal stabilizers, including lead, are used in toys. None."

International Council of Toy Industries
ICTI Background Information
October 9, 1997

International Council Toy Industries (ICTI) statement regarding lead in toys:

"More than 30 years ago, when lead in toys was first identified as toxic, it was the Toy Industry which took the lead to protect children. The Toy Manufacturers of America (TMA) in cooperation with the American Academy of Pediatrics jointly developed the

first toy safety standard limiting lead in paint and similar surface coatings, manufacturers around the world have limited the use of lead in toys ever since.

"The voluntary standard established in the United States under ASTM F-963 and the European standard under EN-71 for soluble lead in toys (lead which may migrate from the toy and be ingested by the child) is 90 parts-per-million. At that level, any intentional use of lead in paints or other surface coatings containing lead would immediately put the toy over the permitted limit.

"Under federal law, The US Consumer Product Safety Commission (CPSC) enforces a standard for total lead of 600 ppm. Recently, the CPSC refused to lower the lead limit in paint and other similar surface coating materials to 100 ppm after finding that most paints sold in the United States were already at or below that level and therefore these materials did not present an unreasonable risk of injury warranting further government regulation.

"The Global Toy Safety Standard now being drafted by the International Standardization Organization (ISO-TCI 181) adopts the standards in force in the United States and in Europe.

"Finally, the US Customs Service and the Consumer Product Safety Commission initiated an inspection project dubbed Operation Toyland.; Trained Customs and CSPC specialists carry out inspections to make sure that all toys brought into the United States conform to CPSC regulations with special focus on lead in paints.

"No one disputes the toxic effects of lead. It is poison. It is unthinkable that toy manufacturers, the very people whose mission in life is to provide safe playthings for children, would not be in the forefront of efforts to see that those children come to no harm. Rest assured. They are."

Press Release from the U.S. Consumer Product Safety Commission:

For Immediate Release
October 9, 1997 Contact: Kathleen Begala
(301) 504-0580 Ext. 1193

CPSC Releases Lead and Cadmium Test Results on Vinyl Products

"Washington, D.C. - Greenpeace released a study today alleging that hazardous levels of lead and cadmium are present in many popular vinyl children's products. Testing by the U.S. Consumer Product Safety Commission (CPSC) does not support this conclusion.

"CPSC takes action when it learns that products contain hazardous levels of lead. However, CPSC testing found that seven of the 11 vinyl products in which Greenpeace found high levels of lead had no or only trace levels of lead. CPSC conducted further analysis on the four other vinyl products and found two are not hazardous because exposure is not likely, and testing on two is incomplete. Children's health is at risk when

they are exposed to hazardous levels of lead. This exposure occurs through ingestion or inhalation.

"Of the 11 products, CPSC found eight had no or only trace levels of cadmium and one was not hazardous because exposure is not likely. Testing on two of the products is incomplete.

"Using CPSC's experience with vinyl miniblinds, Greenpeace asserts that toxic dust will inevitably be released when vinyl products deteriorate. CPSC staff found that vinyl miniblinds do deteriorate when continuously exposed to sunlight and heat. However, CPSC experts do not believe that the vinyl products tested by Greenpeace will deteriorate because they are not exposed to the same extent of sunlight and heats the vinyl miniblinds.

"CPSC has most recently identified and taken actions to reduce or eliminate the risk of lead poisoning from a number of children's products and consumer products in which lead was accessible to children. These included imported crayons, imported non-glossy miniblinds, playground equipment and children's jewelry.

"CPSC is continuing to evaluate the information provided by Greenpeace and will take action as appropriate."

Statement from Rick Maas and Steve Patch, the U. of NC scientists who conducted the aging tests, about the CPSC's press release:

ENVIRONMENTAL QUALITY INSTITUTE
UNCA
One University Heights
Asheville, NC
28804-3299
Laboratory Ph. (704) 251-6895
Fax: (704) 251-6913

Review of U.S. Consumer Product Safety Commission October 9, 1997, News Release

by Dr. Richard P. Maas and Dr. Steven C. Patch

University of North Carolina at Asheville, Environmental Quality Institute

As experienced and nationally-recognized researchers on lead exposure potential from various consumer products, and having recently completed testing for lead and cadmium exposure potential in various children's vinyl products, we offer the following observations and comments related to today's news release by the CPSC.

1. Apparently only single samples of just 11 products were tested. This is far insufficient scope to accurately evaluate the much more extensive research conducted by Greenpeace and the Environmental Quality Institute (EQI).
2. CPSC apparently found lead above trace levels in four of the 11 (36%) products they tested. From a public health perspective, this may be viewed as a high percentage and does not seem to be in conflict with Greenpeace's finding of lead over 100 parts-per-million (ppm) in 28 out of 131 products (21%). It is possible that lead contamination may be sporadic across these vinyl products types. Thus, it is not surprising that CPSC, using only single samples, might find high levels of lead in only four of 11 products where Greenpeace found elevated lead levels. Conversely, it is likely that high lead levels might be found in other samples of products which were previously observed to be lower in lead. It is difficult to evaluate the CPSC statements without knowing what they mean by "trace levels."
3. Apparently three of the 11 products (27%) tested had cadmium levels above trace amounts. Again, for reasons noted above, this would not appear to be in conflict with the Greenpeace findings and should probably be properly interpreted as a relatively high incidence of cadmium contamination.
4. The CPSC has apparently done no testng of these children's vinyl products for the release of lead and cadmium dust resulting from sunlight exposure. Rather they simply suggested that this is not a problem because the products are not exposed to the same amount of sunlight as miniblinds, which released large amounts of lead. We find this conclusion particularly puzzling given that:

    a) The children's backpacks, raingear, tent poles, and beach gear we tested were intended for outdoor use without the benefit of a glass barrier which absorbs most UV light as in the case of miniblind exposure.

    b) We found relatively large amounts of lead released, in some of the products tested, after simulated ultraviolet light exposure.

    c) In at least one of the products tested, levels of lead and/or cadmium were available on the product surface even before we began the simulated sunlight exposure tests. Given the previous experience with vinyl miniblinds, where lead was not released until after sunlight exposure, but then released in very large amounts, it would appear highly imprudent to dismiss these children's products as significant sources of lead and cadmium exposure without at first at least conducting sunlight exposure tests similar to the miniblind tests, particularly in the face of independent laboratory sunlight tests by the EQI indicating a significant exposure problem.

In summary, it appears that the CPSC has gone to extraordinary lengths to draw negative conclusions from a very small study that itself appears to indicate the presence of significant lead and cadmium exposure potential.

Greenpeace Rebuttal to U.S. Consumer Product Safety Commission Test Results

Washington, D.C. -- The Consumer Product Safety Commission (CPSC) hurriedly issued a press release (#98-008) describing a few test results of vinyl products for lead and cadmium. The CPSC action was timed to occur the night before the release of a seven month Greenpeace investigation that reveals hazardous levels of both metals in vinyl children's products throughout the U.S.

The CPSC incompletely described the results of 11 tests. Neither the products nor the actual quantities of lead or cadmium were revealed by the agency.

The Greenpeace report, "Lead and Cadmium in Vinyl Children's Products", fully discloses the results of 131 product tests followed by testing in 10 major U.S. cities along with experiments that demonstrate that both metals are available for ingestion by children. All testing was conducted by independent laboratories according to established government protocols used by the CPSC.

The CPSC also concluded, without data, that vinyl products tested by Greenpeace will not deteriorate since they are exposed to less sunlight than vinyl miniblinds. In contrast, Greenpeace actually performed the scientific experiment. The University of North Carolina tested the deterioration of vinyl products using CPSC protocols and found that dangerous levels of both lead and cadmium were released by the products.

The Greenpeace investigation carefully, and comprehensively tested products throughout the U.S. and subjected the results to peer review by a distinguished panel of physicians and scientists. The CPSC press release attempts to allay Greenpeace and public concerns regarding children's vinyl products by stating conclusions without providing data for only 11 tests.

The CPSC appears to offer false reassurance to parents that vinyl products containing lead and cadmium are not widespread. This conclusion is not supported by their findings and is inconsistent with their mandate to protect the nation's children.

Greenpeace Letter of protest to U.S. Consumer Product Safety Commission Chair Ann Brown

October 14, 1997

Ann Brown
Chair
Consumer Product Safety Commission (CPSC)
Washington, D.C.
20207

Dear Ms. Brown,

We believe it is essential that the Consumer Product Safety Commission (CPSC) issue a statement of clarification regarding vinyl children's products and warn the public that reputable scientists and experts in the field of childhood lead exposure believe that heavy metal exposure from these products presents an avoidable risk that ought to be of concern to parents.

On Wednesday, October 8, 1997, the Consumer Product Safety Commission (CPSC) issued press release #98-008. The press release stated that testing of 11 vinyl products by the CPSC "does not support" the findings of the Greenpeace report, "Lead and Cadmium in Vinyl Consumer Products." CPSC staff repeatedly emphasized this point in press interviews.

The circumstances surrounding the release of the CPSC statement are troubling. Greenpeace had provided senior CPSC staff with an embargoed copy of the Greenpeace report in advance to enable appropriate comment. However, CPSC staff chose instead to release testing information without the actual data from an incomplete investigation that was hurriedly initiated upon receipt of a leaked copy of the Greenpeace report. The press statement was characterized in a way which tended to dismiss the Greenpeace findings, rather than acknowledge their significance.

We have now learned that the CPSC incorrectly measured lead and cadmium levels in vinyl plastic and then distorted the reporting of its own data. It is thus unconscionable that you let the Commission's initial response stand.

The CPSC measured lead in vinyl with a procedure that was designed to measure lead in paint. The independent labs commissioned by Greenpeace used a procedure designed for determining lead in vinyl. The Environmental Quality Institute (EQI) and Stat Analysis have documented that paint procedures underestimate the lead content of vinyl due to the physical differences between paint and vinyl. The CPSC probably underestimated lead and cadmium levels in several vinyl samples because it used the wrong measurement procedure.

The CPSC press release referred to data without giving any numbers. Greenpeace has learned why. The CPSC data shows four vinyl products that exceed the agency's own legal recall level for lead of 600 ppm. No reference was made to these products in the CPSC press release even though the agency measured lead levels from 810 ppm to 6,300 ppm. The products include a Gemini modular phone cord cable, a Barbie Slumber Tent Pole, a Looney Tunes Hackey Sack, and a Looney Tunes umbrella. In addition, the CPSC failed to report that their results for these hazardous products closely matched those reported by Greenpeace. The Commission ignored their own data which indicated that hazardous levels of lead are present in vinyl products.

The CPSC data also showed that cadmium was undetected in the few products that the agency tested. Unfortunately, a relatively high no-detect threshold of 50 ppm cadmium

was used by the agency. If this is taken into account, the CPSC and Greenpeace data appear to match quite closely.

Finally, the CPSC press release dismissed the hazard posed by release of lead and cadmium from vinyl children's products during degradation in the light. The CPSC asserted that vinyl children's products would get less sunlight than vinyl miniblinds. In contrast to asserting an opinion, Greenpeace commissioned the EQI to conduct a thorough scientific study of products intended for outdoor use. The EQI used the CPSC's own protocol to demonstrate that hazardous amounts of lead and cadmium were released during deterioration of vinyl children's products.

For example, a Barbie backpack purchased at Kmart in nine cities contained 236 ppm - 627 ppm lead and released more than 35 µg of lead and 23 µg of cadmium to its surface during deterioration in the light. These levels are two times higher than the CPSC's own lead exposure standard of 15 µg/day. In California where the backpack was purchased, the lead and cadmium amounts released by the backpack are 70 and 460 times higher than the maximum permissible exposure levels under Proposition 65. This product, along with many others, remains on the shelves of retail stores today. This is simply unconscionable.

The Greenpeace report differs significantly from the CPSC press release. The Greenpeace report discloses the results of a seven month investigation that included 131 product tests followed by testing in 10 major U.S. cities along with experiments conducted by two independent laboratories. The data demonstrates that lead and cadmium are available for ingestion by children. The results were submitted to peer review by a distinguished panel of scientists and physicians. The Greenpeace findings on lead and cadmium further support proposals for moving away from using vinyl in children's products.

In contrast, the CPSC performed a few tests and found four vinyl products that exceeded the agency's own recall level for lead in consumer products. Despite its mandate to protect public health, the CPSC chose not to report this data and the fact that it had partially confirmed Greenpeace findings. Instead, the CPSC issued a press release designed to invalidate the Greenpeace report.

We deem it inappropriate that the CPSC chose to publicly cast doubt on the validity of our work. Either the CPSC should have simply released its data and allowed that it confirmed some of the Greenpeace findings, or the agency should have stated that an investigation was ongoing and no scientific conclusions could be drawn.

It was disingenuous and dangerous to publicly cast doubt on the validity of the Greenpeace investigation. For example, Greenpeace revealed the widespread sale of a piece of vinyl Kentucky Fried Chicken designed to be placed in children's mouths which contained both lead and cadmium. Experiments conducted by Stat Analysis revealed dangerous levels of lead would be released by the chicken if only one-thousandth of an ounce was swallowed.

We have been invited to meet with your technical staff to discuss the differences in data and chemical analysis. We are eager to do so. However, we remain disappointed and concerned that the Commission's public pronouncements on the matter carelessly offered false reassurances to the public at a time when concern should be elevated.

We await your earliest response as to whether the Commission will revise its public statement to accurately convey the essence of its own investigation.

Sincerely,

Joseph Di Gangi, PhD
Scientist, Toxics Campaign
Greenpeace

Acknowledgements

Thanks to the Following Contributors:

Greenpeace Personnel: Bradley Angel, Tom Barnes, Matthew Bramley, Mike Brune, Bill Busse, Paul Clarke, Angel Cohoon, Pat Costner, Charlie Cray, Scott Daugherty, David DeRosa, Craig Engleking, Dwayne Freeman, Rick Hind, Rob King, Bob Lyon, Jack Mento, Aníbal Rivera, Morag Simpson, Jay Townsend, Bill Wash, Jack Weinberg, and J. Weis

Independent Help: Brett Doran, Joel Tickner

Michael McCally, MD, Department of Community Medicine, Mt. Sinai School of Medicine, New York, NY

David Ozonoff, MD, MPH, Chair, Department of Environmental Health, Boston University School of Public Health, Boston, MA

Janet Phoenix, MD, MPH, National Lead Information Center, National Safety Council, Washington, DC

Preparation of Online Version: Kelly Hurley, Jay Townsend, T.J. White